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# USE OF REFLECTIVE PAINTS ON RICE STORAGE BINS

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# USE OF REFLECTIVE PAINTS ON RICE STORAGE BINS

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## Summary

Research was conducted at the Rice-Pasture Experiment Station, Beaumont, Tex., during the hottest part of the summer of 1962 to determine the effectiveness of highly reflective paints for reducing temperatures within rice storage bins having direct exposure to the sun. This study indicated that use of these paints was beneficial in two ways:

1. Rice in these bins remained at a lower temperature and did better in germination tests following an 8-month storage period than did rice in control bins.

2. Empty space above rice was much cooler during the hottest part of summer days. Cooler temperatures would be appreciated by laborers who must enter rice storage bins in hot weather.

## Introduction

Temperature along with moisture content controls the rate of deterioration of seeds in storage. Cooler temperatures are generally associated with superior storage conditions. Temperature can be controlled to a large degree by aeration, but cooling by aeration is not practical during many summer days. The use of highly reflective paint for covering storage bins reduces one source of heat and can be expected, therefore, to reduce internal temperatures. Temperatures were measured within rice storage bins which had been coated with highly reflective paint and within control bins which received no new paint. The purpose of the study was to determine the effect of these temperatures upon certain quality characteristics during an 8-month storage period.

## Procedure

Six steel bins, each 5 feet in diameter and 10 feet tall, were used for storing rice. The bins were placed in a row running east and west with a space of 5 feet between adjacent bins. Two different brands of white paint described by the manufacturers as composed of highly reflective, water-emulsion, resin materials were used. For a check, rice also was stored in bins which received no new coating but previously had been covered with olive drab paint. The arrangement of bins receiving various paint treatments is shown in figure 1.

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Figure 1.--Arrangement of bins.

Bins were painted in accordance with manufacturers' instructions. In general, these were to remove loose paint and rust particles, apply a primer coat, and then apply the water-emulsion resin paint.

Equal amounts of rice were loaded into the bins, and were levelled with 1 foot of empty space remaining below the roofs. After loading, each bin contained approximately 65 hundredweight of TP 49 rice at 12 percent moisture content. Rice samples for quality tests were taken from the center of each bin, 6 feet below roof level, with a bucket probe in April 1962 when the study was initiated and again in January 1963 when the study was concluded. Portions of samples were submitted for official grade and milling tests at the time they were taken. The remainder of samples taken in April were stored in a refrigerator at 38° F. until January so that germination tests for all samples could be made simultaneously. All seeds were placed in an oven and held at 120° F. for 96 hours before being placed in a germinator.

Thermocouple junctions were placed at five locations in each of the bins to measure rice and air temperatures. The locations were the following:

1. In empty space 6 inches below the roof.
2. In rice, center of bin, 6 feet below roof level.
3. In rice, 6 inches from south wall and 6 feet below roof level.
4. In rice, 6 inches from west wall and 6 feet below roof level.
5. In rice, 6 inches from east wall and 6 feet below roof level.

These junctions were connected to a recording potentiometer which was actuated by a timer to record temperatures at 3-hour intervals or eight times each day.

## Results

Figure 2 shows average noontime temperatures, by months, of empty space above the rice (headspace) and of rice in the center of the bins. Both brands of white paint were effective in reducing temperatures as compared with olive drab paint. The most striking temperature differences were found in headspaces. This amounted to as much as 24° F. during the month of July. Rice in the center of white bins remained about 5° F. cooler than in the olive drab bins throughout the period of the test.

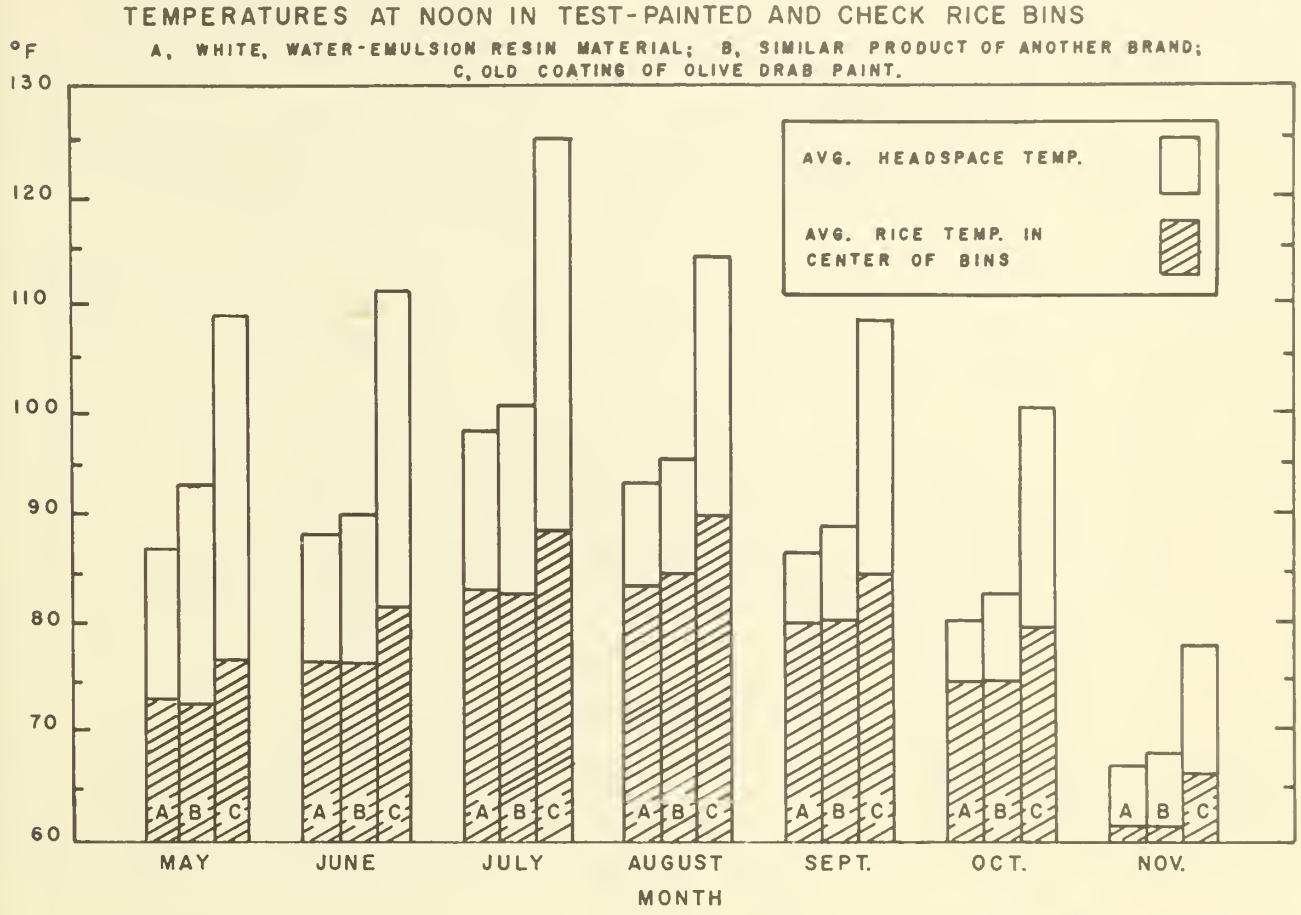


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Figure 2

Temperatures at 3-hour intervals during a day in July are shown in figure 3. The greatest fluctuation was noted for headspace temperatures in check bins. These temperatures were much hotter in the daytime, but slightly cooler at night than were headspace temperatures in the white bins. Rice temperatures 6 inches from the south wall of all bins fluctuated during the day, but rice in the check

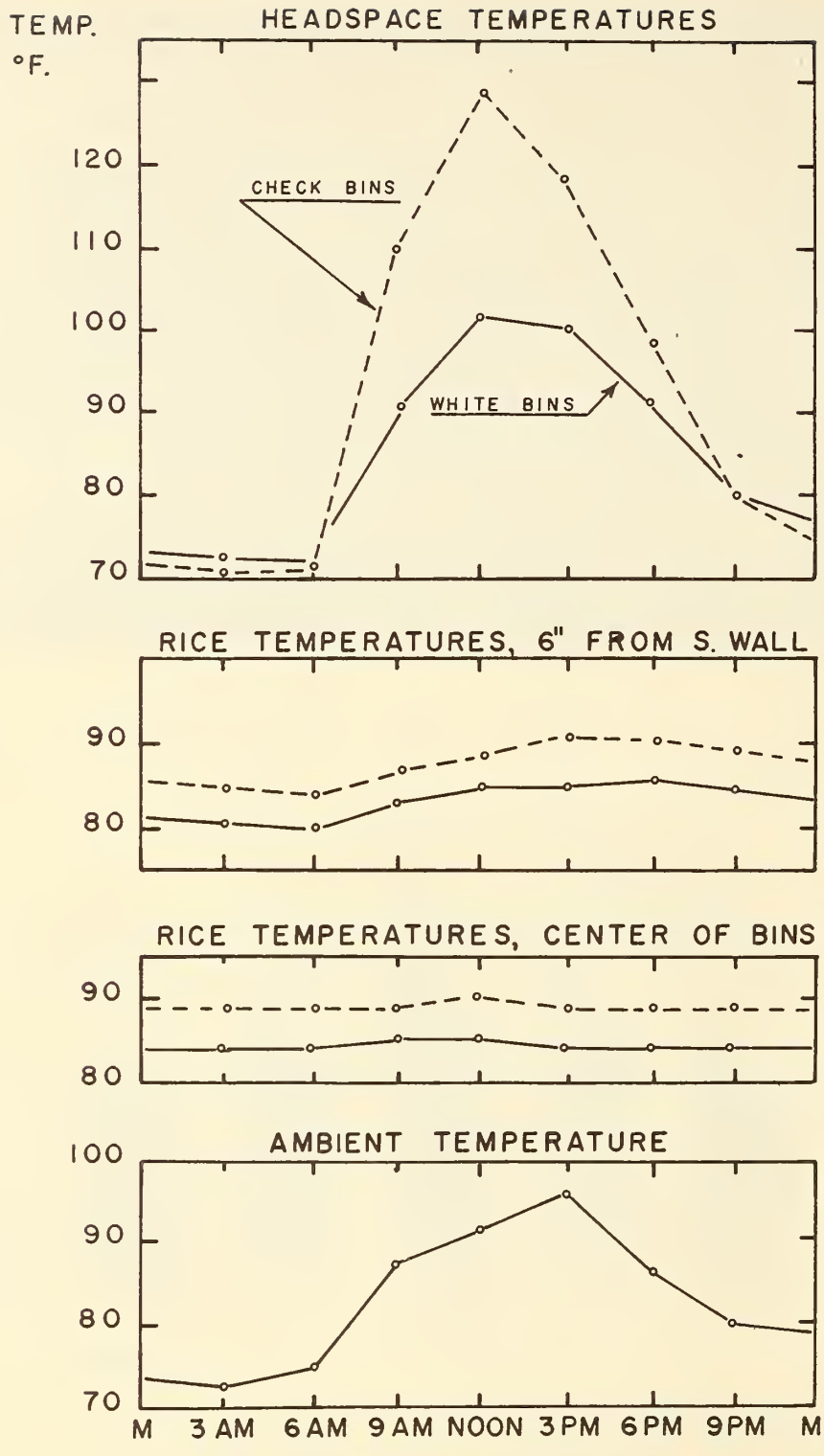


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Figure 3.--Temperatures at different locations in rice bins and outdoor temperatures during a day in July at Beaumont, Tex.

bins remained warmer at all times of the day than rice in the white bins. Rice temperatures in the centers of the bins fluctuated only slightly.

The averages of grades, milling yields, and germination percentages of rice samples taken in April and January from bins receiving the three painting treatments are shown in table 1. Rice from all bins remained at No. 1 grade. A small drop in percentage of head rice was noted for rice from all bins regardless of the paint treatment. The biggest difference was noted for germination tests. Seeds from white bins showed drops in germination of 3.0 to 4.5 percent, but seeds from the check bins showed a drop in germination of nearly 12 percent.

Table 1.--Quality of rice before and after eight months' storage in test bins

| Paint treatment of storage bins1/ and sampling date | Grade | Milling yield | | Germination |
|---|---|---|---|---|
| | | Head | Total | |
| | No. | Percent | Percent | Percent |
| Treatment A: | | | | |
| April 1962..... | 1 | 56.0 | 71.3 | 94.0 |
| January 1963..... | 1 | 53.5 | 71.0 | 89.5 |
| Treatment B: | | | | |
| April 1962..... | 1 | 56.8 | 71.3 | 93.0 |
| January 1963..... | 1 | 54.3 | 71.0 | 90.0 |
| Treatment C: | | | | |
| April 1962..... | 1 | 56.3 | 71.5 | 93.0 |
| January 1963..... | 1 | 54.0 | 71.3 | 81.2 |

1/ Treatment A, bins painted with Brand A of water-emulsion resin paint.
Treatment B, bins painted with Brand B of water-emulsion resin paint.
Treatment C, bins received no new coating of paint.

## Discussion

The tests indicated that the highly reflective paints used were effective in reducing headspace temperatures during midday. When labor such as sampling is required during the hottest part of a summer day, use of reflective paint for a rice bin would be highly recommended.

Rice was cooler in bins covered with reflective paint than in the check bins and germinated better. Even so, use of special paint should be considered only as a means of supplementing other management practices such as fumigation, aeration, or refrigeration for maintaining quality when rice is to be held in long-term storage. Temperatures below 60° F. are needed to inhibit insect infestation and even cooler temperatures are desirable for maintaining the viability of seed rice.

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